LOW INSERTION EFFORT U-BASE RETAINER

TECHNICAL FIELD

[0001] The present invention relates generally to resilient clip fasteners and more particularly to a resilient clip fastener that employs a particular surface geometry to secure the body portion of the resilient clip to a structure. More specifically, the present invention relates to a resilient clip fastener having a construction that utilizes abutment flanges to permit the clip to be inserted into an aperture with a relatively low insertion force while resisting relatively high withdrawal forces. The invention also relates to a resilient clip fastener having a construction that accounts in several manners for part-to-part variation between the structures that are to be fastened together.

BACKGROUND OF THE INVENTION

[0002] Many current vehicles employ resilient clips to secure various components to the vehicle body. One such application concerns interior panels that mount to the interior of the vehicle such as on the doors. Such panels serve not only to provide occupants with a convenient point to grasp during ingress to and egress from the vehicle, but also provide energy absorption during a crash event.

[0003] During assembly of the vehicle, it is conventional procedure of the entire panel assembly to be installed onto the interior of the vehicle in a single operation. In other words, the panel assembly is passed through either the windshield or backlight opening of the vehicle body on the assembly line and then the panel assembly is secured by line operators to the interior of the vehicle.

[0004] In order to accomplish this assembly task, the panel assembly is typically equipped with numerous fasteners, located around the periphery of the panel assembly as well as at predetermined locations around the interior area of the panel, that are adapted to penetrate through corresponding holes located in the reinforcing sheet metal members of the vehicle interior. It is the responsibility of the line operators to properly orient

the panel assembly adjacent the interior of the vehicle and press the fasteners into the various mounting holes in the reinforcing sheet metal members to secure the panel assembly to the interior of the vehicle.

[0005] For aesthetic reasons, the panel fasteners are typically secured in some fashion to the backside of the panel so that they are not visible from the interior of the vehicle after the panel assembly is installed. Consequently, it is often incumbent upon the line operators to blindly "feel" for the location of the mounting holes with their fingers before pressing the fasteners into the holes from the opposite show-surface side of the panel.

[0006] Due to slight misalignments, which can occur between the fasteners and their corresponding mounting holes, some of the fasteners may not be properly seated and secured to the sheet metal.

[0007] Accordingly, there remains a need in the art for an improved fastener having a relatively low installation force and a relatively high removal force that is relatively more tolerant of misalignment problems. Ideally, the fastener should be inexpensive to manufacture, reliable and simple to install. Furthermore, the fastener should be particularly adapted for securing structures to one another in a manner, which minimizes vibration, and the concomitant noise problems that are often associated with such fasteners.

SUMMARY OF THE INVENTION

[0008] In one preferred form, the present invention provides a resilient clip for engaging a structure. The resilient clip includes a body portion having a pair of top flanges, a pair of fastening members and a pair of abutting flanges. Each of the fastening members has a base portion that is coupled to an associated top flange. Each of the abutting flanges has a concave surface that engages the mounting structure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Additional advantages and features of the present invention will become apparent from the subsequent description and the

appended claims, taken in conjunction with the accompanying drawings, wherein:

[0010] Figure 1 is a perspective view of a fastener constructed in accordance with the teachings of the present invention;

[0011] Figure 2 is a lower perspective view of the fastener of Figure 1;

[0012] Figure 3a is a side view of a portion of the fastener of Figure 1 illustrating the spacing of the structures in greater detail;

[0013] Figures 3b and 3c depict cross-sectional views of the fastener depicted in Figure 3a;

[0014] Figure 4 is a side view of a fastener constructed in accordance with the teachings of the preferred embodiment of the present invention;

[0015] Figure 5a is a top view of a portion of the fastener of Figure 1, illustrating the clip structure in greater detail;

[0016] Figures 5b and 5c depict cross-sectional views of the fastener depicted in Figure 5a;

[0017] Figure 6 is a lower perspective view of the fastener of Figure 1;

[0018] Figure 7 is a bottom view of the fastener of Figure 1;

[0019] Figure 8 is a perspective view of the fastener of Figure 1;

[0020] Figure 9 is an exploded perspective view showing the fastener being used to mount an interior trim component;

[0021] Figures 10a and 10b show the insertion of the fastener;

[0022] Figure 11 is a cross-sectional view of the fastener of Figure 10 with corresponding trim component

[0023] Figure 12 is a perspective view of a fastener constructed in accordance with the teachings of a second embodiment of the present invention;

[0024] Figure 13 is a lower perspective view of the fastener of Figure 12;

[0025] Figure 14a is a side view of a portion of the fastener of Figure 13 illustrating the spacing of the structures in greater detail;

[0026] Figures 15b and 15c depict cross-sectional views of the fastener depicted in Figure 14a;

[0027] Figure 16 is a side view of a fastener constructed in accordance with the teachings of the preferred embodiment of the present invention;

[0028] Figure 17a is a top view of a portion of the fastener of Figure 12, illustrating the clip structure in greater detail;

[0029] Figures 5b and 5c depict cross-sectional views of the fastener depicted in Figure 5a;

[0030] Figure 16 is a lower perspective view of the fastener of Figure 12;

[0031] Figure 17 is a bottom view of the fastener of Figure 12;

[0032] Figure 18 is a perspective view of the fastener of Figure 12;

[0033] Figure 19 is an exploded perspective view showing the fastener being used to mount an interior trim component;

[0034] Figures 20a and 20b show the insertion of the fastener; and

[0035] Figure 21 is a cross-sectional view of the fastener of Figure 20 with corresponding trim component

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0036] Referring to Figures 1 through 8, a generally U-shaped fastener 20 in accordance with the present invention is disclosed. The generally U-shaped fastener 20 is defined by a body portion 22 and a pair of top flanges 24. Integral with the top flanges 24 are two pair of finger members 26 which are used to couple the generally U-shaped fastener 20 to a mounting flange (shown in Figure 11). Additionally, the body portion 22 has a pair of abutting flanges 28 which generally lie outside side members 29 and 30 of the body portion 22. The side members, which are coupled by a bottom curved member 29 and 30,

define a pair of apertures 32 and 33, which allow for the inward compression of the abutting flanges 28.

[0037] Generally, the abutting flanges 28 are defined by three portions. The first portion 36 is defined by an exterior concave engaging surface 50. The second portion 37, which acts as a transition to the third portion 38, is defined by a convex surface. The third portion 38 functions to couple the abutting flange 28 to the base portion 40 of the body 22 of the generally U-shaped fastener 20.

[0038] Figure 3a depicts a side view of the generally U-shaped fastener 20 of the current invention. Shown is the relationship of the finger members 26 to the abutting flanges 28, which are formed within the aperture 32. As best seen in Figures 3b and 4, the tips 42 of the finger members 26 are angled to frictionally engage a flange member 54 of a trim component 60. Figure 3b shows the relationship of the third portion 38 to the base member 40 of the body portion 22.

[0039] Figure 4 is a side view of the U-shaped fastener 20 and shows the relationship of the abutting flanges 28 to the body portion 22. As can be seen, the top flanges 24 defines an upper keyhole slot 46 which allow the movement of the abutting flanges 28 when they are compressed. Further depicted is the angular relationship of the side members 29 and 30 of the body portion with respect to the base 40 and the top flanges 24. It must be noted that while the finger member 26 are shown, any suitable fastener is usable. This includes but is not limited to a hole, threaded hole, slots or flanges.

[0040] Figure 5a depicts a top view of the generally U-shaped fastener 20. Defined by the side members 29 and 30 is a slot 48 which is used to engage the coupling flange 54 (see Figures 9 and 11) of a trim component 60. The exterior concave surface 50 of the abutting flanges 28 are used to engage sheet metal to hold the fastener in place. Also depicted is the interior surface 52 of the finger members 26, which engage the surfaces of the coupling flange 54.

[0041] Figure 5b is a cross-section of the fastener as shown in Figure 5a. Depicted is the relationship of the abutting flanges 28 with the base

member 40. Further, the cross-section details the radius of the exterior concave surface 50. The radius of the concave surface 50 generally can be between 3.5 to 6.0 millimeters and preferably 4.75 millimeters. The center of curvature for the radius R is between 2 and 4 millimeters from the top of the fastener and preferably 2.3 millimeters. Figure 5c best details the relationship of the finger members 26 to the top flanges 24 and the first and second flange members 43 and 44.

[0042] Figures 6 through 8 are depictions of the U-shaped fastener 20 of the current invention with hidden components shown in phantom. Depicted is the relationship of the fastener components with various surfaces of the fastener.

[0043] Figure 9 depicts the use of the U-shaped fastener 20 of the current invention. Shown is a sheet metal structure 56, which defines a pair of apertures 58. The apertures 58 are designed to accept the U-shaped fastener 20 to allow for the mating of a trim component 60 to the sheet metal 56. The trim component 60 has a pair of flanges 54, which are inserted, into the slot 48 of the U-shaped fastener 20.

[0044] As best seen in Figure 10, the U-shaped fastener 20 is inserted into the aperture 58 of the sheet metal structure 56. As the fastener 20 is depressed into the aperture 58, the abutting flanges 28 are compressed toward each other and the centerline of the U-shaped fastener 20. This compression of the abutting flanges 28 continues until the sheet metal 56 of the aperture 58 reaches the second portion 37 of the abutting flanges. At this point, a transition occurs and the sheet metal 56 is allowed to engage with the concave surface 56 of the first portion 36 of the abutting flanges 28.

[0045] Figure 11 depicts the coupling of the trim component 60 to the U-shaped fastener 20. Shown is the coupling flange 54 inserted between the finger members 26 of the U-shaped fastener 20.

[0046] It has been shown that the current fastener 20 is significantly more easy to insert into a sheet metal structure 56 than it is to remove. For example, the fastener as depicted has a required insertion force of about 10 pounds and a removal force of greater than 20 pounds.

[0047] Referring to Figures 12 through 20, a generally U-shaped fastener 20 in accordance with a second embodiment of the present invention is disclosed. The generally U-shaped fastener 120 is defined by a body portion 122 and a pair of top flanges 124. Integral with the top flanges 124 are two pair of first finger member 126 and a pair of second finger member 127 which are used to couple the generally U-shaped fastener 120 to a mounting flange (shown in Figure 20). Additionally, the body portion 122 has a pair of abutting flanges 128 which generally lie outside the side members 129 and 130 of the body portion 122. The side members 129 and 130 define a pair of apertures, 132 and 133, which allow for the inward compression of the abutting flanges 128.

[0048] Generally, the abutting flanges 128 are defined by three portions. The first portion 136 is defined by an exterior concave engaging surface 150. The second portion 137, which acts as a transition to the third portion 138, is defined by a convex surface. The third portion 138 functions to couple the abutting flange 128 to the base portion 140 of the body 122 of the generally U-shaped fastener 120.

[0049] Figure 14a depicts a side view of the generally U-shaped fastener 120 of the second embodiment of the current invention. Shown is the relationship of the first finger member 126 and second finger member 127 to the abutting flanges 128, which are formed within the aperture 132. As best seen in Figures 14b and 15, the tips 142 of the first finger member 126 and the tips 143 of the second finger member 127 are angled to frictionally engage a flange member 154 of a trim component 160. The angle of the first finger member 126 can be between about 15° to 25° and preferably about 20°, while the angle of the second finger member 127 can be between about 50° to 60° and preferably about 55°. Figure 14b shows the relationship of the third portion 138 to the base member 140 of the body portion 122.

[0050] Figure 15 is a side view of the U-shaped fastener 120 and shows the relationship of the abutting flanges 128 to the body portion 122. As can be seen, the top flanges 124 defines an upper keyhole slot 146 which allow the movement of the abutting flanges 128 when they are compressed. Further

depicted is the angular relationship of the side members 129 and 130 of the body portion with respect to the base 140 and the top flanges 124. It must be noted that while the finger members 126 and 127 are shown, any suitable fastener is usable. This includes but is not limited to a hole, threaded hole, slots or flanges.

[0051] Figure 15a depicts a top view of the generally U-shaped fastener 120. Defined by the side members 129 and 130 is a slot 148 which is used to engage the coupling flange 154 (see Figures 19 and 21) of a trim component 160. The exterior concave surface 150 of the abutting flanges 128 are used to engage sheet metal to hold the fastener in place. Also depicted is the interior surface 152 of the first and second finger members 126 and 127, which engage the surfaces of the coupling flange 154.

[0052] Figure 15b is a cross-section of the fastener as shown in Figure 15a. Depicted is the relationship of the abutting flanges 128 with the base member 140. Further, the cross-section details the radius of the exterior concave surface 150. The radius of the concave surface 150 generally can be between 3.5 to 6.0 millimeters and preferably 4.75 millimeters. The center of curvature for the radius R is between 2 and 4 millimeters from the top of the fastener and preferably 2.3 millimeters. Figure 15c best details the relationship of the first finger member 126 to the top flanges 124 and the first and second flange members 143 and 144.

[0053] Figures 16 through 18 are depictions of the U-shaped fastener 120 of the current invention with hidden components shown in phantom. Depicted is the relationship of the fastener components with various surfaces of the fastener.

[0054] Figure 19 depicts the use of the U-shaped fastener 120 of the current invention. Shown is a sheet metal structure 156, which defines a pair of apertures 158. The apertures 158 are designed to accept the U-shaped fastener 120 to allow for the mating of a trim component 160 to the sheet metal 156. The trim component 160 has a pair of flanges 154, which are inserted, into the slot 148 of the U-shaped fastener 120.

[0055] As best seen in Figure 20, the U-shaped fastener 120 is inserted into the aperture 158 of the sheet metal structure 156. As the fastener 120 is depressed into the aperture 158, the abutting flanges 128 are compressed toward each other and the centerline of the U-shaped fastener 120. This compression of the abutting flanges 128 continues until the sheet metal 156 of the aperture 158 reaches the second portion 137 of the abutting flanges. At this point, a transition occurs and the sheet metal 156 is allowed to engage with the concave surface 156 of the first portion 136 of the abutting flanges 128.

[0056] Figure 21 depicts the coupling of the trim component 160 to the U-shaped fastener 120. Shown is the coupling flange 154 inserted between the first and second finger members 126 and 127 of the U-shaped fastener 120.

[0057] It has been shown that the current fastener 120 is significantly more easy to insert into a sheet metal structure 156 than it is to remove. For example, the fastener as depicted has a required insertion force of about 10 pounds and a removal force of greater than 20 pounds.

[0058] The foregoing discussion discloses and describes exemplary embodiments of the present invention. One skilled in the art will readily recognize from such a discussion, and from the accompanying drawings and claims that various changes, modifications, and variations can be made therein without departing from the spirit and scope of the invention.